

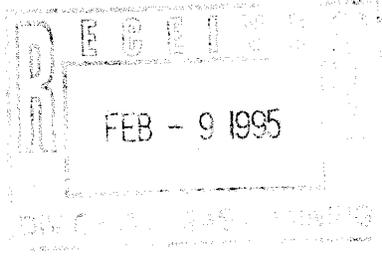
M/035/002

Kennecott  
Utah Copper  
P.O. Box 525  
Bingham Canyon, Utah 84006-0525  
(801) 569-6506

**Frederick D. Fox**  
Director, Environmental Affairs

**Kennecott**

January 31, 1995



Mr. Lynn Kunzler  
State of Utah Department of Natural Resources  
Division of Oil, Gas and Mining  
355 West North Temple  
Salt Lake City, UT 84180-1203

Subject: Baseline Data from Bingham Canyon Mine Biosolids  
Test Plots

Dear Mr. Kunzler:

Please find attached a copy of the baseline data report generated for the Bingham Canyon Mine Biosolids Test Plots. This report partially fulfills the approval letter requirements to provided interim, progress and final reports for the biosolids application project.

Lisa Rogers from the State of Utah Division of Water Quality (DWQ) and Robert Brobst from the U. S. Environmental Protection Agency (EPA) Region VIII will also be provided with copies of the baseline data report. If you have any questions regarding the attached report or the project, please call Jon Cherry of my staff at (801) 569-6208.

Very truly yours,

*Frederick D. Fox*  
Frederick D. Fox

FDF\JCC\jcc  
Attachment

# BINGHAM CANYON MINE BIOSOLIDS TEST PLOTS BASELINE DATA

## INTRODUCTION

The Bingham Canyon Mine Biosolids Reclamation Project is located immediately northwest of Kennecott Utah Copper's (KUC) Bluewater I Cutoff Wall and Repository in the NE/SW Section 18, Township 3 South, Range 2 West, Salt Lake Base Meridian. The general scope of the project is to apply biosolids (municipal sewage sludge) from the Central Valley Water Reclamation Facility (CVWRF) to a series of waste rock test plots as a soil amendment. The purpose of this report is to provide baseline data collected from the test plots prior to biosolids application.

## TEST PLOTS

Fifteen test plots were surveyed and constructed on the northeast end of the 5816 level near the toe of the mine waste rock dumps. Each plot measures 16 feet wide by 50 feet long with the long axis running east-west. The individual plots are separated by approximately 5 feet (see Attachment A). The project area was graded to an even slope dipping approximately 20 degrees to the east. The surface lithology 0 feet through 2.7 feet consists of yellow brown sandy, silty, clayey quartzitic mine waste rock. Dark brown volcanic derived silty clay underlie the waste rock.

## PRE-APPLICATION SOIL CHARACTERIZATION

Prior to biosolids application, a total of 13 soil samples and 1 water sample were collected from the test plots on November 14 and November 22, 1994. These samples were collected to develop baseline data that will be used later to help determine the effectiveness of the various treatments planned for each plot. The samples were submitted for analyses to Ford Analytical Laboratories on November 18 and November 22, 1994 respectively. The corresponding chains of custody and analytical results are located in Attachment B.

## WATER SAMPLE SITE

The single water sample was collected from a sump at the base of the waste rock dumps located approximately 800 feet south of the test plot area. This sump is the nearest upgradient surface water source in relation to the test plots. Water with a pH of 2.5 and conductivity of 37,000 umhos/cm flows into the sump at approximately 60 gpm. The sample mentioned above is identified as LEAWA81.

## SOIL SAMPLE SITES

Thirteen soil samples were collected from the test plots prior to biosolids application. Three trenches were excavated to a depth of 4 feet immediately east of test plots #4, #8, and # 12 respectively. From each trench, four grab samples were collected at the following depths: 0'-1', 1'-2', 2'-3', and 0'-2'. The thirteenth sample was a 15 point composite sample with each point (1/2 pound) being collected from the center of each plot at a depth of 0"-12". The following table presents the sample ID's, depths, and soil type for each sample:

### BIOSOLIDS TEST PLOTS SOIL SAMPLES

<u>TRENCH</u>	<u>SAMPLE ID</u>	<u>DEPTH</u>	<u>SOIL TYPE</u>
1	MSBWT1	0'-1'	Mine Waste Rock
1	MSBWT1	1'-2'	Mine Waste Rock
1	MSBWT1	2'-3'	Mine Waste Rock
1	MSBWT1	0'-2'	Mine Waste Rock

<u>TRENCH</u>	<u>SAMPLE ID</u>	<u>DEPTH</u>	<u>SOIL TYPE</u>
2	MSBWT2	0'-1'	Mine Waste Rock
2	MSBWT2	1'-2'	Mine Waste Rock
2	MSBWT2	2'-3'	Mine Waste Rock
2	MSBWT2	0'-2'	Mine Waste Rock
3	MSBWT3	0'-1'	Mine Waste Rock
3	MSBWT3	1'-2'	Mine Waste Rock
3	MSBWT3	2'-3'	Dark Brown Silty Clay, minor volcanic clasts.
3	MSBWT3	0'-2'	Mine Waste Rock

### ANALYTICAL TESTING

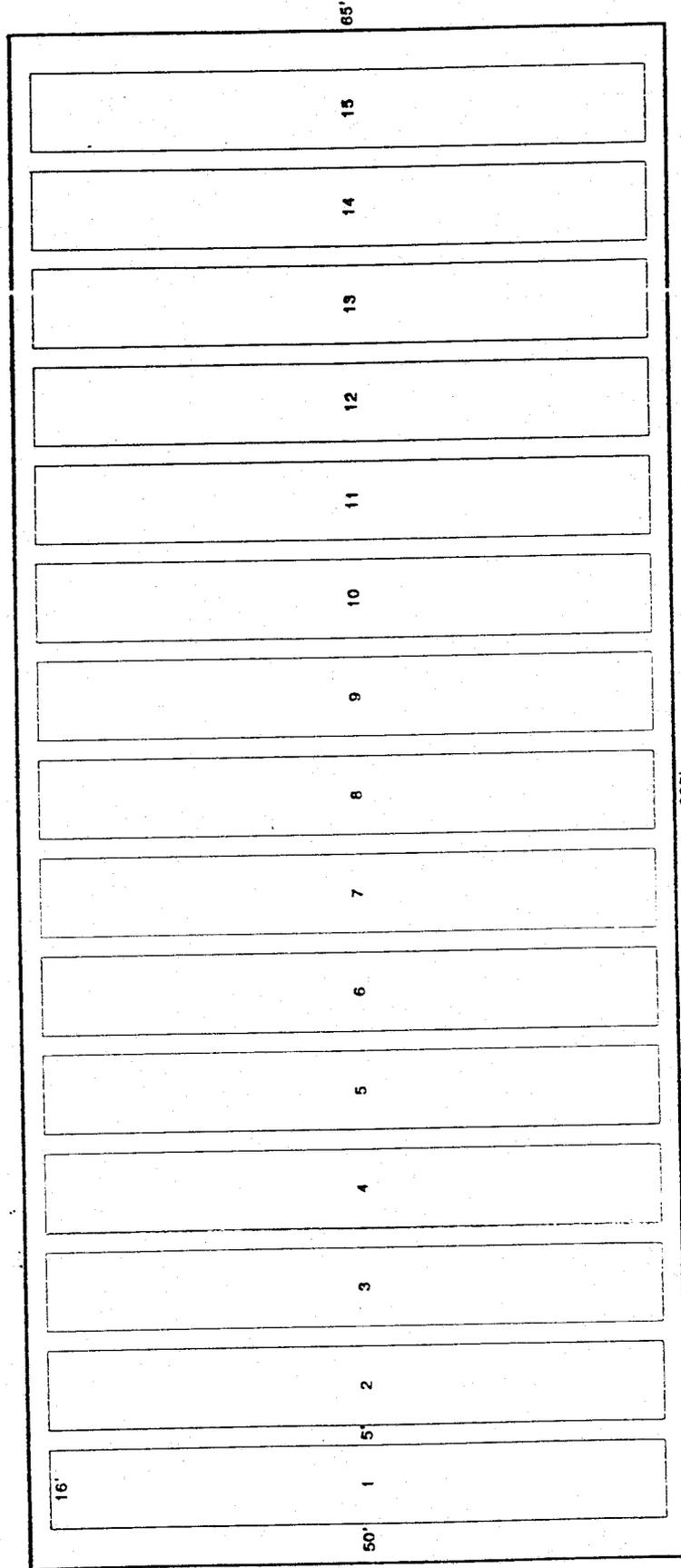
The 15 point composite sample was tested for the agricultural and metal constituents listed below in 1A and 1B respectively. All trench samples from the 0'-1', 1'-2', and 2'-3' intervals were analyzed per 1A below. The four trench samples from the 0'-2' interval were analyzed per 1B below. The water sample was analyzed for: Dissolved Metals (Fe, Zn, Cu, Mn, Cd, Pb, Ni, Cr, Al, As, Hg, Mo and Se and Totals (Ca, Mg, Na, K, Cl, SO<sub>4</sub>, conductivity, pH, acidity, and TDS). The water and soil analytical results are located in Appendix B.

- 1A Agricultural - pH, SAR, EC, nitrogen as nitrate and nitrite, water holding capacity, CEC, acid-base potential, total organic matter content, soil texture, phosphorus, and carbon to nitrogen ratio (C:N).
- 1B Metals - DTPA extractable metals (Fe, Zn, Cu, Mn, Cd, Pb, Ni, Cr, saturation extractable metals (Ca, Na, Mg) and total metals for As, Hg, Mo, and Se.

# **APPENDIX A**

KENNECOTT UTAH COPPER CORPORATION  
APPLICATION OF MUNICIPAL SEWAGE BIOSOLIDS  
BINGHAM CANYON MINE WASTE ROCK DUMPS

NORTH END 5816 EASTSIDE WASTE ROCK DUMP  
TEST PLOT LAYOUT



Not To Scale

All test plots are located on waste rock and are within the closed Eastside Collection System.

Each plot is 16' x 50' = 800 s.f.

Total Area = 0.5 Acre

9/94

## **APPENDIX B**



KENNECOTT UTAH COPPER CORPORATION CHAIN OF CUSTODY RECORD PLANT PROJECTS GROUP

PROJECT NAME/LOCATION: *Kennecott Plant Projects* PPG 0366  
*Myciross bizaac / serdaga / blue water I*

SAMPLE I.D. NO.	DATE COLLECTED	SAMPLE TYPE			NO. OF CONTAINERS	ANALYSIS REQUESTED	REMARKS
		SOIL	WATER	OTHER			
MSBWT1 0-1'	11/14/94	✓				Needs Analysis	
MSBWT1 1-2'	"	✓				1st	
MSBWT1 2-3'	"	✓				① pH, SAR, EC, NaCl (R <sub>2</sub> + NR <sub>2</sub> )	
MSBWT1 0-2'	"	—				Water, chloride cap, Cl <sup>-</sup> , AR, Bl	
MSBWT2 0-1'	"	—				1st, 2nd, 3rd, 4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 20th, 21st, 22nd, 23rd, 24th, 25th, 26th, 27th, 28th, 29th, 30th, 31st, 32nd, 33rd, 34th, 35th, 36th, 37th, 38th, 39th, 40th, 41st, 42nd, 43rd, 44th, 45th, 46th, 47th, 48th, 49th, 50th, 51st, 52nd, 53rd, 54th, 55th, 56th, 57th, 58th, 59th, 60th, 61st, 62nd, 63rd, 64th, 65th, 66th, 67th, 68th, 69th, 70th, 71st, 72nd, 73rd, 74th, 75th, 76th, 77th, 78th, 79th, 80th, 81st, 82nd, 83rd, 84th, 85th, 86th, 87th, 88th, 89th, 90th, 91st, 92nd, 93rd, 94th, 95th, 96th, 97th, 98th, 99th, 100th	
MSBWT2 1-2'	"	—				② DTPA metals - Fe, Zn, Cu, Mn, Cd, Pb, Ni, Cr.	
MSBWT2 2-3'	"	—				③ Sat, Fxl. metals: Ca, Na, Mg	
MSBWT3 0-1'	"	—				④ Total metals: As, Hg, Mo, Se.	
MSBWT3 1-2'	"	—					
MSBWT3 2-3'	"	—					
MSBWT3 0-2'	"	—					
MSBWT3 1-15	11/14/94	—					

RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
<i>Orin V. [Signature]</i>	11/17/94		<i>Stan [Signature]</i>	11/17/94	11:30
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:
RELINQUISHED BY:	DATE:	TIME:	RECEIVED BY:	DATE:	TIME:

REMARKS: *Results to Len Marris*  
*AY Monday DEC 6*

# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UT 84006

Date: 12/22/94

SAMPLE: BINGHAM MINE - ES & WS DRAINAGE LEACH WATERS  
Water Samples Received Nov 22, 94 through Dec 06, 94 for Analysis.

Sample #: LEAWA81

Total, mg/L	Method	MDL	Result
Aluminum, Al (Diss)	EPA 200.7	0.01	6,280
Arsenic, As (Diss)	EPA 200.7	0.01	0.38
Calcium, Ca (T)	EPA 200.7	0.1	572
Cadmium, Cd (Diss)	EPA 200.7	0.01	0.55
Chromium, Cr (Diss)	EPA 200.7	0.01	1.03
Copper, Cu (Diss)	EPA 200.7	0.01	484
Iron, Fe (Diss)	EPA 200.7	0.01	267
Lead, Pb (Diss)	EPA 200.7	0.01	ND
Magnesium, Mg (T)	EPA 200.7	0.1	11,330
Manganese, Mn (Diss)	EPA 200.7	0.01	434
Potassium, K (T)	EPA 200.7	0.1	0.97
Selenium, Se (Diss)	EPA 200.7	0.01	ND
Sodium, Na (T)	EPA 200.7	0.1	5.71
Zinc, Zn (Diss)	EPA 200.7	0.01	230
Acidity	EPA 305.1	1	33,100
Chloride, Cl	EPA 325.3	1	282
Conductivity, umhos/cm	EPA 120.1	10	37,900
pH Units	EPA 150.1		2.89
Sulfate, SO <sub>4</sub>	SM 4500	5	77,700
TDS	EPA 160.1	5	105,000
Nitrate, N	EPA 353.1	4	ND
Nitrite, N	EPA 354.1	0.01	0.28
Nickel, Ni	EPA 200.7	0.01	46
Mercury, Hg	EPA 245.1	0.0002	ND
Molybdenum, Mo	EPA 200.7	0.01	0.052

Approved By: 

NOTE: All Analyses performed by ChemTech, Inc.

# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

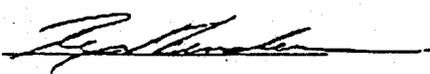
DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT1-0-1'

Total	Method	Result
pH Units	EPA 9040	2.73
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	3,304
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	2,405
Water Soluble Sodium as Na, mg/Kg	EPA 6010	1.1
Conductivity, umhos/cm	EPA 120.1	7,030
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	4.76
Water Holding Capacity, %	CALC.	32.3
CEC, meq/100gm	ASTM	12.3
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	31.2
Total Organic Matter, %	USU	0.33
Sieve:		
% Rock	USC	37.3
% Sand	USC	30.4
% Silt/Clay	USC	32.3
Phosphorus as P (T), mg/Kg	EPA 6010	1,234
Carbon Nitrogen Ratio	CALC.	6.67
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	55.7
Zinc, Zn	EPA 6010	30.8
Copper, Cu	EPA 6010	304
Manganese, Mn	EPA 6010	38.5
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	5.48
Nickel, Ni	EPA 6010	7.14
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	47.7
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	30.6
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018617)

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## ANALYTICAL LABORATORIES

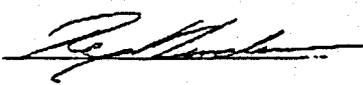
DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT1-1-2'

Total	Method	Result
pH Units	EPA 9040	2.70
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	3,221
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	2,478
Water Soluble Sodium as Na, mg/Kg	EPA 6010	<1
Conductivity, umhos/cm	EPA 120.1	7,330
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	3.45
Water Holding Capacity, %	CALC.	32.2
CEC, meq/100gm	ASTM	11.7
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	31.2
Total Organic Matter, %	USU	0.24
Sieve:		
% Rock	USC	45.9
% Sand	USC	27.7
% Silt/Clay	USC	26.4
Phosphorus as P (T), mg/Kg	EPA 6010	1,274
Carbon Nitrogen Ratio	CALC.	5.49
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	29.7
Zinc, Zn	EPA 6010	27.7
Copper, Cu	EPA 6010	334
Manganese, Mn	EPA 6010	39.3
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	4.23
Nickel, Ni	EPA 6010	6.97
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	50.4
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	35.0
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018618)

# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT1-2-3'

Total	Method	Result
pH Units	EPA 9040	2.76
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	2,822
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	2,555
Water Soluble Sodium as Na, mg/Kg	EPA 6010	<1
Conductivity, umhos/cm	EPA 120.1	7,500
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	2.33
Water Holding Capacity, %	CALC.	31.0
CEC, meq/100gm	ASTM	12.3
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	93.8
Total Organic Matter, %	USU	0.41
Sieve:		
% Rock	USC	49.7
% Sand	USC	25.4
% Silt/Clay	USC	24.9
Phosphorus as P (T), mg/Kg	EPA 6010	1,300
Carbon Nitrogen Ratio	CALC.	11.03
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	17.8
Zinc, Zn	EPA 6010	24.8
Copper, Cu	EPA 6010	364
Manganese, Mn	EPA 6010	30.9
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	3.57
Nickel, Ni	EPA 6010	6.89
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	55.4
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	40.8
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018619)

- 
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# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

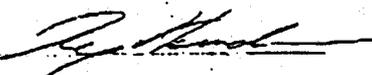
DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT1-0-2'

Total	Method	Result
pH Units	EPA 9040	2.72
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	2,760
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	2,120
Water Soluble Sodium as Na, mg/Kg	EPA 6010	<1
Conductivity, umhos/cm	EPA 120.1	8,010
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	2.16
Water Holding Capacity, %	CALC.	30.4
CEC, meq/100gm	ASTM	12.6
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	84.4
Total Organic Matter, %	USU	0.30
Sieve:		
% Rock	USC	32.8
% Sand	USC	31.8
% Silt/Clay	USC	35.4
Phosphorus as P (T), mg/Kg	EPA 6010	1,252
Carbon Nitrogen Ratio	CALC.	6.30
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	38.4
Zinc, Zn	EPA 6010	31.7
Copper, Cu	EPA 6010	305
Manganese, Mn	EPA 6010	37.1
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	4.55
Nickel, Ni	EPA 6010	6.96
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	48.2
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	32.6
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018620)

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## ANALYTICAL LABORATORIES

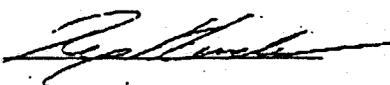
DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT2-0-1'

Total	Method	Result
pH Units	EPA 9040	3.32
SAR	CALC.	0.11
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	5,714
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	2,573
Water Soluble Sodium as Na, mg/Kg	EPA 6010	38.3
Conductivity, umhos/cm	EPA 120.1	7,540
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	2.42
Water Holding Capacity, %	CALC.	37.5
CEC, meq/100gm	ASTM	15.3
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	40.6
Total Organic Matter, %	USU	0.51
Sieve:		
% Rock	USC	35.5
% Sand	USC	33.1
% Silt/Clay	USC	31.4
Phosphorus as P (T), mg/Kg	EPA 6010	1,284
Carbon Nitrogen Ratio	CALC.	15.92
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	8.96
Zinc, Zn	EPA 6010	31.8
Copper, Cu	EPA 6010	430
Manganese, Mn	EPA 6010	18.7
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	2.85
Nickel, Ni	EPA 6010	3.11
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	50.9
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	36.3
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018621)

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# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

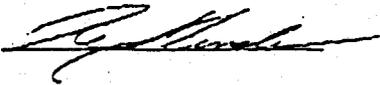
DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT2-1-2'

Total	Method	Result
pH Units	EPA 9040	3.15
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	2,756
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	2,992
Water Soluble Sodium as Na, mg/Kg	EPA 6010	1.5
Conductivity, umhos/cm	EPA 120.1	6,530
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	2.69
Water Holding Capacity, %	CALC.	31.4
CEC, meq/100gm	ASTM	12.1
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	59.4
Total Organic Matter, %	USU	0.49
Sieve:		
% Rock	USC	34.5
% Sand	USC	30.2
% Silt/Clay	USC	35.3
Phosphorus as P (T), mg/Kg	EPA 6010	1,299
Carbon Nitrogen Ratio	CALC.	7.89
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	12.4
Zinc, Zn	EPA 6010	23.3
Copper, Cu	EPA 6010	431
Manganese, Mn	EPA 6010	24.8
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	1.70
Nickel, Ni	EPA 6010	8.55
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	56.6
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	35.8
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018622)

# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT2-2-3'

Total	Method	Result
pH Units	EPA 9040	3.15
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	4.161
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	3,248
Water Soluble Sodium as Na, mg/Kg	EPA 6010	1.7
Conductivity, umhos/cm	EPA 120.1	8,220
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	2.21
Water Holding Capacity, %	CALC.	34.9
CEC, meq/100gm	ASTM	11.4
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	96.9
Total Organic Matter, %	USU	0.46
Sieve:		
% Rock	USC	68.6
% Sand	USC	16.8
% Silt/Clay	USC	14.6
Phosphorus as P (T), mg/Kg	EPA 6010	1,371
Carbon Nitrogen Ratio	CALC.	7.27
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	11.4
Zinc, Zn	EPA 6010	28.9
Copper, Cu	EPA 6010	467
Manganese, Mn	EPA 6010	22.4
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	2.10
Nickel, Ni	EPA 6010	9.25
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	55.2
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	58.8
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018623)

# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

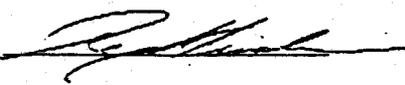
DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT2-0-2'

Total	Method	Result
pH Units	EPA 9040	3.21
SAR	CALC.	0.08
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	5,044
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	2,375
Water Soluble Sodium as Na, mg/Kg	EPA 6010	27.2
Conductivity, umhos/cm	EPA 120.1	6,490
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	5.89
Water Holding Capacity, %	CALC.	38.8
CEC, meq/100gm	ASTM	13.9
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	43.8
Total Organic Matter, %	USU	0.65
Sieve:		
% Rock	USC	36.4
% Sand	USC	29.9
% Silt/Clay	USC	33.7
Phosphorus as P (T), mg/Kg	EPA 6010	1,142
Carbon Nitrogen Ratio	CALC.	8.88
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	9.99
Zinc, Zn	EPA 6010	27.1
Copper, Cu	EPA 6010	433
Manganese, Mn	EPA 6010	31.3
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	4.30
Nickel, Ni	EPA 6010	6.55
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	46.6
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	26.6
Selenium, Se	EPA 6010	<.1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018624)

# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

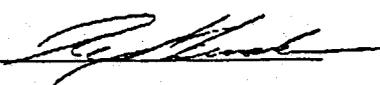
DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT3-0-1'

Total	Method	Result
pH Units	EPA 9040	3.46
SAR	CALC.	0.03
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	4,389
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	1,777
Water Soluble Sodium as Na, mg/Kg	EPA 6010	8.8
Conductivity, umhos/cm	EPA 120.1	7,180
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	4.18
Water Holding Capacity, %	CALC.	36.9
CEC, meq/100gm	ASTM	15.6
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGMA	56.2
Total Organic Matter, %	USU	0.89
Sieve:		
% Rock	USC	39.7
% Sand	USC	28.5
% Silt/Clay	USC	31.8
Phosphorus as P (T), mg/Kg	EPA 6010	1,334
Carbon Nitrogen Ratio	CALC.	10.00
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	6.46
Zinc, Zn	EPA 6010	37.3
Copper, Cu	EPA 6010	402
Manganese, Mn	EPA 6010	21.6
Cadmium, Cd	EPA 6010	0.30
Lead, Pb	EPA 6010	1.91
Nickel, Ni	EPA 6010	3.21
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	66.5
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	36.5
Selenium, Se	EPA 6010	<.1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018625)

# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT3-1-2'

	Method	Result
Total pH Units	EPA 9040	2.77
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	3,275
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	1,593
Water Soluble Sodium as Na, mg/Kg	EPA 6010	<1
Conductivity, umhos/cm	EPA 120.1	5,270
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	5.15
Water Holding Capacity, %	CALC.	34.2
CEC, meq/100gm	ASTM	13.2
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	62.5
Total Organic Matter, %	USU	0.39
Sieve:		
% Rock	USC	35.6
% Sand	USC	30.0
% Silt/Clay	USC	34.4
Phosphorus as P (T), mg/Kg	EPA 6010	1,421
Carbon Nitrogen Ratio	CALC.	5.69
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	153
Zinc, Zn	EPA 6010	32.6
Copper, Cu	EPA 6010	220
Manganese, Mn	EPA 6010	46.5
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	8.21
Nickel, Ni	EPA 6010	5.78
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	55.1
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	50.3
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018626)

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# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT3-2-3'

Total	Method	Result
pH Units	EPA 9040	6.38
SAR	CALC.	0.04
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	1,896
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	1,162
Water Soluble Sodium as Na, mg/Kg	EPA 6010	9.1
Conductivity; umhos/cm	EPA 120.1	2,180
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	6.26
Water Holding Capacity, %	CALC.	32.0
CEC, meq/100gm	ASTM	18.4
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	11.6
Total Organic Matter, %	USU	2.0
Sieve:		
% Rock	USC	15.2
% Sand	USC	25.4
% Silt/Clay	USC	59.4
Phosphorus as P (T), mg/Kg	EPA 6010	827
Carbon Nitrogen Ratio	CALC.	14.05
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	8.54
Zinc, Zn	EPA 6010	102
Copper, Cu	EPA 6010	177
Manganese, Mn	EPA 6010	126
Cadmium, Cd	EPA 6010	1.69
Lead, Pb	EPA 6010	375
Nickel, Ni	EPA 6010	4.16
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	67.0
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	8.4
Selenium, Se	EPA 6010	<.1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018627)

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# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBWT3-0-2'

Total	Method	Result
pH Units	EPA 9040	2.96
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	2,879
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	2,006
Water Soluble Sodium as Na, mg/Kg	EPA 6010	<1
Conductivity, umhos/cm	EPA 120.1	5,150
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	3.22
Water Holding Capacity, %	CALC.	33.0
CEC, meq/100gm	ASTM	12.8
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	34.4
Total Organic Matter, %	USU	0.32
Sieve:		
% Rock	USC	47.0
% Sand	USC	28.2
% Silt/Clay	USC	24.8
Phosphorus as P (T), mg/Kg	EPA 6010	1,275
Carbon Nitrogen Ratio	CALC.	8.03
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	41.4
Zinc, Zn	EPA 6010	38.2
Copper, Cu	EPA 6010	379
Manganese, Mn	EPA 6010	39.7
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	10.8
Nickel, Ni	EPA 6010	7.42
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	53.7
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	44.9
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018628)

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# CHEMTECH/FORD

## ANALYTICAL LABORATORIES

DATE: 12-12-94

TO: KENNECOTT PLANT PROJECT GROUP  
%ASIM MUKERJEE  
P.O. BOX 112  
BINGHAM CANYON, UTAH 84006

SAMPLE: PLANT PROJECTS  
Soil Samples received November 21, 1994 for analysis.

SAMPLE #: MSBW1-15

Total	Method	Result
pH Units	EPA 9040	2.72
SAR	CALC.	<.01
Water Soluble Calcium as Ca, mg/Kg	EPA 6010	1,977
Water Soluble Magnesium as Mg, mg/Kg	EPA 6010	1,062
Water Soluble Sodium as Na, mg/Kg	EPA 6010	<1
Conductivity, umhos/cm	EPA 120.1	6,370
NO <sub>3</sub> -N + NO <sub>2</sub> -N, mg/Kg	EPA 353.1	3.53
Water Holding Capacity, %	CALC.	32.2
CEC, meq/100gm	ASTM	14.1
Acid Base Potential, tons CaCO <sub>3</sub> /1000 tons soil	DOGM	37.5
Total Organic Matter, %	USU	0.32
Sieve:		
% Rock	USC	34.3
% Sand	USC	31.6
% Silt/Clay	USC	34.1
Phosphorus as P (T), mg/Kg	EPA 6010	1,245
Carbon Nitrogen Ratio	CALC.	9.65
DTPA, mg/Kg:		
Iron, Fe	EPA 6010	15.7
Zinc, Zn	EPA 6010	57.4
Copper, Cu	EPA 6010	496
Manganese, Mn	EPA 6010	21.4
Cadmium, Cd	EPA 6010	<.1
Lead, Pb	EPA 6010	1.83
Nickel, Ni	EPA 6010	6.70
Chromium, Cr	EPA 6010	<.1
TOTAL, mg/Kg:		
Arsenic, As	EPA 6010	55.2
Mercury, Hg	EPA 7471	<.2
Molybdenum, Mo	EPA 6010	38.0
Selenium, Se	EPA 6010	<1

Approved By: 

NOTE: All analyses performed by ChemTech, Inc.  
(U018629)

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